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ABSTRACT

An examination of the introspective evidence of artists and scientists on their creative processes suggests that determining the causes underlying the transformation of material in thought is the key for understanding creativity. A similar problem underlies the transformational process of understanding metaphor. T.S. Kuhn's view of scientific revolutions and the nature of thought in dreams provides evidence for transformations in thought under the impact of experiential anomalies. Such transformations are guided by or express affective states or attitudes. Evidence for the productive role of affect in thought can be found in several sources, including research on the frontal regions of the brain and the affective correlates of response to metaphor. An adequate theory of creativity must await further research on the anticipatory properties of affect, but a useful place to begin research is with the response to metaphor. (Author/FL)

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Technical Report No. 300

METAPHOR AND TRANSFORMATION: THE PROBLEM OF CREATIVE THOUGHT

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Abstract

An examination of introspective evidence of artists and scientists on their creative processes suggests that determining the nature of the causes underlying the transformation of material in thought is the key problem for understanding creativity. A similar problem underlies the transformational process of understanding metaphor. Evidence for transformations in thought under the impact of experiential anomalies is provided by Kuhn's view of scientific revolutions and the nature of thought in dreams. Such transformations are guided by or express affective states or attitudes. Evidence for the productive role of affect in thought is presented from several sources, including research on the frontal regions of the brain and the affective correlates of response to metaphor. It is suggested that an adequate theory of creativity must await further research on the anticipatory properties of affect, but that a useful place to begin such research is with the response to metaphor.

Metaphor and Transformation: The Problem of Creative Thought

The processes of thought underlying creative behavior are still poorly understood. The experimental tradition in cognitive psychology, which has been so productive of insights into other types of thought, still has almost nothing to offer here. The thought transformations that take place in creativity pose a major problem for psychological theory. I shall suggest that essentially the same problem is faced by those seeking to explain the thought processes involved in understanding metaphor. The reason for this may lie in the exclusive attention given to thought per se by cognitive psychologists, to the neglect of affective matters (Zajonc, 1980). In this paper I shall suggest that one way of enriching cognitive theory is by studying the role of affect in thought, and that a promising place to start is to look at the ways affect may facilitate the response to metaphor. I look at evidence that affect may guide thought in productive ways, and suggest that creative thought of the highest order may be the result of such affective processes.

The conditions under which affect might play this role are impossible to study directly. Creative thought of the most productive kind cannot be made the object of laboratory investigation: its occurrence is too unpredictable, and its complexity is such that even were an Einstein or a Stravinsky to be placed in the psychologist's laboratory the limitations on what could be observed or measured militate against finding much evidence of value. But thought transformations analogous to

those in creativity can be found in one or two other domains where, as it turns out, it is possible to point to the productive role of affect in initiating and leading the development of thought. One of the features of such domains is the encounter with anomalies, as in scientific thinking, according to Thomas Kuhn's (1970) original view of scientific theory-formation; but a similar thought pattern is also discernible in dreams and in comprehension of metaphor. The model of creative thought that will be sketched, therefore, will consist of two key components: the encounter with anomalies, and the productive role of affect. It will be directed towards elucidating the transformational processes in creative thought.

Psychological investigations of creativity have spanned a wide range of factors in an attempt to uncover its determinants. But there has been a confusion of objectives rsulting from a failure to delimit the areas of concern. Previous investigations by psychologists have also tended to underestimate the real, and probably insuperable, complexity of factors involved in the creative process. As Karl Popper (1976, p. 47) remarks, what some psychologists have sought is a theory of <u>successful</u> creative thinking. But, he adds, "I think that the demand for a theory of successful thinking cannot be satisfied, and that it is not the same as the demand for a theory of creative thinking."

The limit indicated here by Popper is a helpful one, and will be observed in the present study. My concern will accordingly be with the nature and dynamics of creative thought,

not with the conditions which determine its success. R. L. Mooney (1963, p. 331) pointed to four separate lines of inquiry that should be distinguished: (a) the product created, (b) the process of creation, (c) the personality of the creator, and (d) the types of environment in which creation seems to come about. The present discussion will be confined mainly to the second.

Transformations

As Graham Wallas (1926) showed, a great deal of suggestive information is to be found in the introspective comments of eminent artists and scientists, speaking about what they have observed of their own thought processes during creation. Wallas's model, now little remembered, put the various elements of the creative process into sequential order, a set of stages, beginning with "preparation" and moving through "incubation" and "illumination" to "verification." Some support for Wallas's view was obtained experimentally by such workers as Patrick (1934) and Eindhoven and Vinacke (1952). These studies, however, raise several unsolved theoretical questions, and in this respect they offer a useful starting point for the present discussion.

Patrick gathered a group of practising poets and asked them to write a poem in a short time under laboratory conditions. The stimulus given to the poets was a detailed picture of a landscape. Each poet was observed by Patrick as he worked, and the written evidence of his progress towards a finished poem was studied for signs of Wallas's four stages of thought. Patrick claimed to have found evidence of incubation--defined by Wallas

as the elaboration of an idea in unconsciousness prior to its realization in consciousness. This was provided by "those cases in which the idea of the poem appeared earlier in the report, after which the poet talked of various things, and then this original idea appeared as the subject of the poem." She found evidence of this kind in over two thirds of her subjects.

Patrick also questioned her subjects afterwards about their experience of creative work generally, and many of the replies indicated an awareness of incubation-like processes. A typical comment of the poets was this reply:

> A poem is a spiritual irritation. It annoys me until it breaks out. I sometimes incubate a mood for years. I do not incubate the lines. The idea lies fallow and comes back when conditions are favourable. (p. 30)

Some speak in this way of the recurrence of a mood; others talk of carrying around a word or a line.

Patrick's experiment is suggestive, although her demand that the poets talk aloud as they work may have disrupted normal creative thought more than she acknowledged. In the experiment all thought took place in the light of the known demand that a poem be produced. Outside the experiment, however, the first sign reported by the poet was an awareness of a mood or line already signalling a potential poem: the thought was the issue of some incubatory period which must be supposed to have run its course earlier. This mood or line may then go underground again in a further period of incubation. It was awareness of this

process that the poets were able to report. The verbal reports of the experiment were able to show only that incubation of ideas had taken place; the appearance and development of moods, which did not appear in the protocols, may be of greater significance. These are uncapturable by such a method (and probably thwarted in some cases).

As this study indicates, the problem to be addressed is how incubation itself is initiated and how it is kept in process--that is, how the mood or idea once formed continues to develop productively. Such development was shown in an experiment carried out with painters by Eindhoven and Vinacke. A poem was given to a number of artists and non-artists, who were asked to produce an illustration in response. Several weeks were allowed, and the subjects were able to work at home when they chose. All the evidence on paper of the various attempts towards a final acceptable picture were collected. It was found that the artists produced more sketches at first than the non-artists, and varied the nature of the activity within the sketches more, and then spent comparatively longer on the final version. But the most interesting observation was that the sketches of the artists showed a connection lacking in those of the non-artists, somewhat along the lines found by Patrick:

> when the sketch selected as publishable is compared with preceding sketches, it appears that artists tend to combine elements from preceding sketches--that is, the satisfactory sketch is more similar to preceding sketches than these are

> to each other. The publishable sketch chosen by the non-artist is no more similar or dissimilar to preceding sketches than others in the series. (p. 160)

The artists' ideas tended to elaborate into a more inclusive, organized whole, whereas the non-artist showed only variation with no development.

The earlier sketches of the artists in this experiment were a type of incubation that was both conscious and unconscious--unconscious partly because the end of the process was not yet in view, and because ideas that were present in the earlier sketches disappeared from the conscious attention of the artist for a while, then reappeared integrated into the final picture. What integrating agency in thought is responsible for such transformations has yet to be explained. Outside creativity itself, plenty of evidence for the active transformation of material in memory has accumulated since Bartlett's (1932) classic studies demonstrated the phenomenon, but here the processes involved tend to work towards the revision of material in thought to accommodate it to previous understanding; Bartlett's subjects, for example, altered details of the strange stories with which they had been presented to accord with the more rational standards of story structure they were used to. In creative thought, by contrast, old material evolves towards something distinctively new. How such transformations are

initiated, and what energies or motives may underlie the highly productive elaborations that result, are the main questions to which I now turn.

Anomalies

Wallas's notion of incubation is supported by the two studies I have cited, although it is clear from the second that it is a more flexible process than the strictly consecutive set of stages envisaged by Wallas--incubation takes place on a number of ideas at various times during the course of creative work. What, in these studies, might count as preparation in Wallas's terms is not discussed, but it is difficult to see how any direct study could reasonably attempt to do so. Preparation is perhaps the most ill-defined of Wallas's stages. What counts as preparation would seem to range from the conscious detailed work on a given problem, as in Poincarè's (1946) famous account of his own thought processes, to anything or everything in the creative person's previous experience. If this is so, then it also follows that it would be impossible in most instances of creative thought to develop a conception of what may have taken place during incubation. But if incubation does take place, some special characteristic regarding the thought material of preparation must be discoverable which will cause the involuntary and unconscious transformations that follow, since it must be assumed that by no means all preparatory thought issues in a creative transformation--problems are abandoned unsolved, much experience never finds its way into a novel or poem. What is the

special agency that will generate a creative idea out of one set of circumstances for an individual but not another? This, as quickly becomes apparent, is the heart of the problem.

One general aspect of preparation that has often been noticed is that the creative person has a wide range of interests. The more the creative person knows in a wide variety of fields the better. Rosamond Harding (1940) instances some famous geniuses in history: James Watt, for example, known to us as an innovative chemist and physicist, was also interested in antiquities, medicine, etymology, music, law, metaphysics, and German philosophy and poetry. R. K. White's (1931) study of the biographies of three hundred eminent men of the last five hundred years showed the versality of Watt to have been typical of most of the group. The advantages of such scope were indicated by Barlett (1958), in speaking about experimental scientists:

> Far the most important aspects of the experimenter's need to master method and to handle apparatus is that in the majority of cases . . . the method and the instrumentation are brought into his field of work from the outside. There is something about experimenting, sometimes even in its routine forms, which demands a variety of interests. (p. 133)

Here, a model procedure developed in one field is important for use in another. More generally, a concept developed in one field may be applied to understanding another. Clearly the more versatile the scientist the wider the range of concepts at his

disposal. As Poincaré observed, the most productive ideas in mathematics

> are those which reveal to us unsuspected kinship between other facts, long known, but wrongly supposed to be strangers to one another.
>
> Among chosen combinations the most fertile will often be those formed of elements drawn from domains which are far apart. (p. 386)

This view of creative thought is familiar from the writing of Arthur Koestler (1964) who coined the useful term "bisociation" to describe it.

Metaphor, it will be noticed, is often explained in similar terms: the most interesting metaphors are those where the contributing concepts draw on the most dissimilar domains (Tourangeau, 1982). But it has yet to be explained how the transfer of ideas across domains comes to be understood in metaphor; specifically, it is not clear how the concepts in one domain help to structure the view in the other. In what sense can ideas be said to cross from one domain to another--if it makes sense at all? Similarly, the crossing of ideas between domains in creative thought, while it appears to take place as a regular feature of such thought, is, as a process, very poorly understood. Why and how it happens raises essentially the same difficulty for cognitive psychology as the phenomenon of metaphor. As I shall mention below, a solution to the one problem would seem to imply a solution to the other.

Besides the wide knowledge spanning several domains that often seems a condition of preparation, another factor that has been described is that of curiosity or wonder. Einstein's (1949) account of this faculty in the scientist suggests one way that domains might interact:

> For me it is not dubious that our thinking goes on for the most part without use of signs (words) and beyond that to a considerable degree unconsciously. For how, otherwise, should it happen that sometimes we "wonder" quite spontaneously about some experience? This "wondering" seems to occur when an experience comes into conflict with a world of concepts which is already sufficiently fixed in us. Whenever such a conflict is experienced hard and intensively it reacts back upon our thought world in a decisive way. The development of this thought world is in a certain sense a continuous flight from "wonder." (p. 9)

Einstein's comment shows the necessity of setting aside or going beyond established concepts.

It also locates the origin of new thought in a conflict between experience and existing knowledge. Einstein gave a graphic account of one such moment in his experience as a young man, when he saw the contradictions between Planck's new law of radiation by discrete "quanta" of energy and the formulations of classical mechanics. At the time, he said,

> All my attempts . . . to adapt the theoretical foundations of physics to this new type of knowledge failed completely. It was as if the ground had been pulled out from under one with no firm foundation to be seen anywhere, upon which one could have built. (p. 45)

Under these circumstances, there may take place, in the scientific field concerned, what Kuhn (1970) called a paradigm switch: that is, a new set of symbolic formulations, theories, and exemplary experimental solutions replaces the existing set. This itself constitutes creative thought of the highest order. Such a total reorganisation does not arise gradually or logically out of a process of interpreting the data afresh. The new paradigm, or a glimpse of it, instead emerges all at once--as Kuhn adds, "sometimes in the middle of the night, in the mind of a man deeply immersed in crisis" (p. 90).

This type of event is in marked contrast to how normal science is described; in Kuhn's account, this is concerned with the development and testing of existing theory, involving the elimination of anomalies between what theory predicts and what is observed. Only when the number of anomalies grows too great, calling into question the explanatory power of current theory (as "quanta" did in regard to classical mechanics for Einstein) is such a paradigm switch likely to occur. The key to a new theory often seems to come from the consideration of a concept from a different field. The blocking of the normal categorizing functions of thought brought about by insuperable anomalies may

initiate a search for some way out of the impasse, widening the field of relevant considerations.

Several scientists have commented on the aesthetic character of a new theory as if this were a hallmark of its distinctive quality. Einstein, for example, praised the achievement of Bohr, in developing his electron theory amidst the crisis of physics mentioned above, as "the highest form of musicality in the sphere of thought" (pp. 46-47). The sense of harmony given by a new theory, Poincaré remarked,

> is at once a satisfaction of our aesthetic needs and an aid to the mind, sustaining and guiding. And at the same time, in putting under our eyes a well-ordered whole, it makes us foresee a mathematical l . . . . The useful combinations are precisely the most beautiful . . . (pp. 391-392)

An essential aspect of the aesthetic sense, it would seem, is its power to guide, to confer a degree of foresight upon thought. Through its aesthetic aspects, the theory is felt to possess the power to order experience beyond the form in which it is first given. The aesthetic sense may also be supposed to operate during normal science, when prevailing theory is being consolidated and tested; but in this case it acts to keep out of play ideas in conflict with existing theory. Aesthetic foresight under normal circumstances registers the expected resolution of anomalies, not their potential as departure points for some emerging new view. The creative scientist is the one whose

aesthetic sense enables him to detect those contradictions in the field that might lead towards a better theory.

The notion of preparation can now be elaborated into three interdependent elements, which together begin to endow it with some explanatory value. Apart from (a) the existing conceptual framework in a given field, there must be (b) encounters with sufficient anomalies to call the existing framework into question, and (c) a search outside the existing framework for concepts not hitherto connected with the field. Einstein's "musicality" suggests something of the character of the search, and Poincaré's "aesthetic" entity conveys a sense of the object at the end of the search. The illumination, when it occurs, specifically resolves all three contributing aspects of the preparation stage into one whole: it reinterprets existing knowledge and shows a relationship to other areas hitherto regarded as separate, and in so doing anomalies disappear---become one with the substance of the new theory. Since all of the existing conceptual framework enters reinterpreted into the new theory, the theory clearly has more applications than can be verified immediately; its potential extension to all that has been thought before must be supposed to surround the illumination with an extensive penumbra of thoughts. Thus the "aesthetic" in scientific thought does not signify something attained, static or finished; it is the attained together with the potential for extension into further areas of thought and meaning. A more

inclusive whole, of which the thinker has some intuition, remains beyond that which has so far been realized.

Few of us are creative scientists. Yet certain intuitive and transformational properties appear to be inherent in thought, despite the tendency noted by Bartlett to accommodate new perceptions to existing concepts. Something of the meaning of these properties can be learned from the evidence of dreams. The same nexus of phenomena can be found as agents of creative thought here as those just discussed--the carrying forward of past experience, the need to resolve anomalies, and bisociation between distant fields, if with less striking and immediate results. As in the preparation stage of creativity, the role and meaning of past experience in dreams (of such significance in scientific thought) is at once crucial and extremely problematical. But examination of dream instances helps to suggest the nature of the relationship.

Without specialist aid, the normal memory for dreams is capricious and of limited help in understanding the role of dreams in the individual's thought. But the awakening of the dreamer under controlled conditions in the laboratory has provided more productive evidence whereby the relationship between thoughts and their development through successive dreams can be studied. An example reported by Rechtschaffen, Vogel, and Shaikun (1963) offers a striking illustration. The dreamer was an undergraduate who had just finished taking her final examinations. The dreams are clearly related in several ways to

the implications of her recent experience. In the first the dreamer is in a boat with friends, and afraid of overturning; in the second she has just taken an examination and is walking outside on a sunny day; in the third she is involved in an odd game maneuvering cars in a parking lot, in which her lab instructor is scoring her performance; in the fourth she is back in a boat (now a racing boat) and deciding it would be better if the boat sank; finally she is observing a scene in a hospital where one patient is about to be substituted for another, as the first is about to die--because "He was an important person, and they couldn't let people know about it" (p. 545).

If, as Foulkes (1966, p. 97) has suggested, the dreams in such a series all treat the same problem, clearly the problem is not treated the same way in each dream. For example, the dreamer is <u>afraid</u> of the boat overturning in the first dream, but by the end of the night she seems to have decided that it would be <u>better</u> if her boat was sunk. The problem that the dreams treat appears to be not so much the examinations themselves as the personal consequences for the dreamer of their results. The dreams show her admitting a fear (what would happen if the boat overturned?), and then to some extent coming to terms with it. That the boat is now a racing boat suggests another assessment of the meaning of the activity at college. But the final dream, set in the hospital, could probably be read as showing considerable residual anxiety over how she would view herself in the light of failure. Her uncertainty is such that the problem of her self-

image is split off and rendered symbolically: she becomes a detached observer contemplating the "death" of the person she believed herself to be and the substitution of another personality. She makes a trial, in other words, of seeing herself as a different person without the risk of the attendant feelings involved in sacrificing her present self-image as somebody "important."

In this way the dream thought exhibits a degree of development in its grasp of the problem as the night proceeds; succeeding dreams reach a more profound understanding of the issues than earlier ones. The spontaneous creativity of the thought in these dreams is striking. The pattern of thought that emerges is one in which thought about immediate or recent events translates into the dream and serves to evoke the expression in a more symbolic form of the thinker's underlying preoccupations. In this respect memory appears in an active role, developing itself productively independently of the conscious control or intentions of the thinker. But if memories are being transformed in dreams, what exactly is it that is being developed? The third dream set in the parking lot provides the most transparent clue. The lab instructor is a reproduction of memory, but his function as a grade giver is derogated by the rather futile nature of the activities he is scoring. This transformation and its symbolic form embodies a judgment. What has developed most significantly, if the third dream is compared with the first, is the <u>attitude</u> of the dreamer towards her activity at college.

Judgments are also a part of memory, of course--the more affective aspect of memory. As such they can serve in the active process of recollection as much as the memory of a perception, as the comment of one of Barlett's (1932) subjects showed. Of his memory for some military faces on cards that had been shown several weeks earlier, he observed:

> I sometimes remembered the judgments I made before. It was not the words I recalled, but simply the fact that I thought so and so about the pictures . . . there seemed to be a reinstatement of a particular "feeling." (p. 60)

What dreams appear to be registering above all are judgments--attitudes towards events, situations, people, future possibilities, and the relation of the dreamer towards these things. The chief point of a dream appears to be the exploration and development of such judgments. Memory elements, whether present as originally laid down or themselves transformed are not the judgments--they are invoked to express and clothe the judgments. If the process of thought in dreams is an indication, then the most fundamental level of thought, the ground of its being, is not the flow of ideas or perceptions, but judgment. In this way, judgment can be seen as the driving power of the dream, with anomaly providing the direction.

Several of the common uses of the word judgment, but not all, are in accord with this suggestion: judgment is the act of placing a complex perception in relation to the goals and beliefs of the self. Of those judgments made by the self, there are

value judgments, certain types of aesthetic judgments, character judgments: each represents a decision based on a reading of the implications of the perception for the self. The dreamer arrives at such a point of decision in relation to her college life in the dream sequence I have discussed. The special act of judgment I am proposing here necessarily involves the self's concept of itself (which may in large part be unavailable to conscious introspection); simple acts of judgment, such as deciding which is the best washing machine to buy, or what colors will look well together in decorating a room, are unlikely to require processing at this fundamental level. The power of judgment, in this special sense, determines the thought transformations seen in dreams.

The causes of a particular dream sequence probably lie in the experience of the preceding day, although Freud's (1958) generalization that only the less important events of the day (for consciousness, that is) are used as a focus for dream formation no longer seems tenable. But some intersection of the day's events with the dreamer's underlying pattern of thoughts and judgments about himself would provide the principal determinants. The events of the day do not leave this body of judgments unaltered--thought, in Barlett's phrase, is a process of schema and correction--and it seems likely that some anomaly at the point of intersection will contribute to initiating the dream of the subsequent night. The experience of the day, in other words, is always likely to invoke some of the long-standing

and continually developing judgments that exist in the depth of thought.

The relation of the dream to daily experience is thus a twofold one: to the concerns of the previous day, whether these have involved serious or mundane matters, and to the accumulated and always developing pattern of subconscious judgments and attitudes that comprises the deeper level of thought. This provides another way of conceiving the preparation phase of creativity, and it shows a similar pattern to the process of scientific thinking that was discussed above. Where the overt anomaly, or "wonder" mentioned by Einstein, initiates the domain crossing in scientific thought, unconscious anomalies in the dreamer's thought initiate the kind of domain crossing that is shown in a dream's manifest imagery--such as the boat with which the undergraduate represented her situation at college. The common factor which makes the anomaly of the dreamer analogous to that of the scientist, is the personal significance of the problem situation which generates the anomaly. The creative scientist, as Einstein's remarks show, has invested his own sense of self in the intelligibility and development of the theories he investigates. For such a scientist, the personal significance of his acts of judgment would seem to constitute the driving power of his creative thought.

A model of creative thought proposed by Ernst Kris (1952) suggested that original thought was fuelled by affective components of the self. He based it on Freud's theory of primary

and secondary process thinking, in which the primary is seen as the affect-laden type of thought shown by the infant, while the secondary is the rational and analytic type of thought shown by the adult. Kris proposed that the artist was distinguished by his ability to regress to primary process thought voluntarily--what Kris called "regression in the service of the ego" (p. 177). Several investigators followed Kris's lead, and were able to demonstrate that the artist showed a greater availability of such thought than the non-artist (e.g., Myden, 1959). According to this view the productive energy of the conceptual material at the preparation stage is given to it by its arousal of long-standing affects and memories. Primary process thought in the artist is that moment at which the new perspective becomes available to the consciousness of the creator. This model, although suggestive, is lacking in a cause for that focussed impetus to cross domains and transform thought that is to be found in dreams and scientific thinking. But it provides another perspective on the productive role that may be assigned to affect in creative thought.

The relation of immediate to past experience has been a feature of each of the types of thought so far examined. Each has allowed additional aspects of the preparation phase of creativity to be sketched in. It is now appropriate to question more closely the nature of preparation and its relation to illumination.

The Process of Creative Thought

Illumination characteristically gives a sense of context. Whether faintly or vividly, there is a sense of some whole beyond the immediately present idea; it is the former that marks out the idea as arresting, making it distinguishable from the normal contents of thought. The description of their creative thought in aesthetic terms by scientists shows the grounds they share in this respect with artists. What is the nature of the preparation that has brought this about? Several forces appear to be at work.

The formative impulse to creative thought appears to be an experience that cannot be reduced to an existing category--in scientific thought, an anomaly. Whether consciously or unconsciously, sufficient anomalies in normal thought appear to cause a search among more remote and hitherto unconsidered concepts, hence setting into motion, as it were, a wider range of concepts in relation to the anomalous experience. Valèry (1957), for instance, spoke of the mobility of the mind, its restlessness and diversity, which for the writer is his incomparable resource.

> The instability, incoherence, inconsequence . . . which trouble and limit the mind in any sustained effort of construction, are just as surely also treasures of possibility, whose riches it senses in its vicinity at the very moment when it is consulting itself. These are the mind's reserves, from which anything may come . . .

And yet not anything at random (as in the trial and error model of creativity, proposed by D. T. Campbell (1960)), but only that which is being sought. Valéry adds: "The mind can always feel in the darkness around it the truth or the decision it is looking for . . ." (pp. 100-101). In genuine creative thought, each idea entertained appears to be related to an end result and helps to elicit it. The preliminary efforts made, whether "right" or "wrong," aid the thinker in clarifying what it is he seeks for; each idea is predictive in a greater or lesser degree of the end result. No trial and error procedure can explain such findings as those of Eindhoven and Vinacke regarding artists. The non-artists in their study, by contrast, showed just such trial and error procedures. The non-artists had no guiding idea, and simply produced a series of varying pictures, randomly generating ideas in which the last sketch showed no advance on the first. It is in his special ability to preconceive his solution in some way that the power of a creative thinker lies. The artist or scientist is, in a sense, eliciting something which is already there; he has not formed it consciously, but the suddenness of illumination, so often reported by creative thinkers, shows that its formation precedes, or is aside from, conscious thought. The resulting paradox was well expressed by Kierkegaard (1971), in the course of his commentary on Mozart:

> The poet wishes for his subject; but, as we say that wishing is no art, it is quite rightly and truthfully said about many impotent poetic wishes. To wish rightly, on the other

> hand, is a great art, or, rather it is a gift. It is the inexplicable and mysterious quality of genius that, like a divining rod, it never gets the idea of wishing except when the thing wished for is present. (p. 48)

To suppose that the affects of childhood--the energy of primary process thinking--were the source of new aesthetic forms in the adult, would clearly be inadequate. Yet the energy of such thought, its fluid, autistic and syncretic nature, may underlie the reorganization of conceptual categories that anomalies in current experience enforce on secondary process thought--that power of the creator's imagination that, in Coleridge's (1971) words, "dissolves, diffuses, dissipates, in order to recreate . . ." (p. 167). The analogous power of the underlying judgment in dreams has already been suggested: the dream work reforms and utilizes images from memory in order to express pictorially otherwise inexpressible thoughts.

The nature of the memory for judgments allows us to suppose that both the childhood forms of primary process thinking and the complex of current attitudes are equally available and active. In the unconscious, memories themselves are timeless, as Freud pointed out: a specific memory only becomes time-marked when it is consciously remembered. All affects and judgments, whether of childhood or of adult origin, are therefore always present, and the current complex of judgments would appear to involve their continual exploration and reinterpretation. Daily conscious experience influences the underlying complex of judgments but

cannot determine either its form or its development; indeed, conscious thought on a given topic may often be at odds with the unconscious judgment that has been made: such conflicts seem not infrequently to be the subject of dreams.

What the creator senses in his unconscious thought, therefore, would appear to be the development of a judgment, expressible through some unique and radical reformulation of his existing repertoire of concepts. Anomalies in his experience have activated developments in his underlying judgments which, sooner or later, require that form of expression that involves a fundamental transformation in his conceptual repertoire. If judgment is the driving power in the preparation stage, then prominence must be given to affect as the agent that reforms and connects concepts. The possession of anomalies itself is not enough to reorganize thought; the crossing of conceptual domains to form a new whole in scientific or artistic thought requires a directed search by some instrument that already "knows" what it is looking for. What evidence might suggest that affect plays this role?

Affective Foresight

Three lines of research can be mentioned: that on the relation of affect and memory, work on the function of the frontal regions of the brain, and the problem of understanding response to metaphor.

Bartlett showed how affect could lead in the recovery of a memory: one of his subjects, quoted above, talked of the

"reinstatement of a particular 'feeling'." The subjective feelings that accompanied the original presentation of the stimulus became, at recall, the cue to recovering the memory. This was an incidental finding of Bartlett's work, and no attempt was made at the time to investigate directly the relation of affect to memory. The question has been taken up again recently, however, by a number of workers. The issue raised by Bartlett's finding is whether affective aspects of representation are integral to the functioning of memory.

Spiro, Crismore and Turner (1982), for example, hypothesized that two kinds of memory coding occur, discursive and experiential (the experiential consisting of attitudes and affects), and that the latter will be more important where previous knowledge provides little basis for coding new information. If memories are coded in some affective register--what Spiro et al. termed "experiential coloration"--then similarity of affect at the time of recall may aid the reconstructive processes. An experiment to test this hypothesis required subjects to learn material while under the effect of a particular mood created by previous exposure to a poem. It was found that later recall of the material was improved by reinstatement of the mood, so that learning appeared to be facilitated by association with a particular affect. A similar effect was demonstrated with young children by Bartlett, Burleson, and Santrock (1982), and by a number of other workers interested in mood-state dependency effects in memory (e.g.,

Bower & Cohen, 1982; Isen, Shalker, Clark, & Karp, 1978; a brief review relating this research to metaphor is available in Miall and Vondruska, 1983b).

These suggestive findings show affect directing memory processes that have traditionally been considered semantic in nature. If affect can initiate the links between concepts required at recall, then it may also play a directing role in more substantial, transformational thought processes. The "experiential coloration," described by Spiro et al. as more relevant in conditions where previous knowledge is inadequate, might assume particular importance in the preparation stage of creativity, where anomalies in experience have unsettled existing knowledge. But here affect must be supposed to do more than simply effect a bridge between a present and a previous concept in memory. Affective "coloration" of experience in itself is a necessary but not a sufficient explanation for the dynamics of the creative thought transformations involved. Affect may also have an anticipatory role to play, leading the conceptual functions of the mind towards the domain which will be the origin of the transformation.

A model of affect functioning in an anticipatory role can be found in work on the frontal region of the brain. To be able to conceive solutions to complex problems, it has been shown, requires the intact functioning of this part of the brain, not for its conceptual functions but for its connections to the affective centers of the brain.

Tests on patients with frontal lesions have tended to show that the chief deficit resulting is an inability to match action as it is carried out with previously formed intentions. The patients described by Milner (1964), for example, asked to sort cards showing simple patterns according to changing criteria, persevered in a course of action after it ceased to be appropriate. On the stylus maze test patients were unable to restrain themselves from rushing towards the goal, in defiance of the rules of the test. Milner observed that in situations requiring a constant shifting of response to meet changing demands, the frontally-lesioned patient is unable to suppress his immediate responses; what appears to have been lost is a modulatory function normally exercised by the frontal region.

Nauta (1971) subsequently pointed to the anatomical evidence for a close relationship between the frontal cortex and various subcortical structures containing the affective centers (the "fronto-limbic" relationship), which indicated that the frontal region combines both sensory and effector functions. The frontal lesion, he suggested, results in a perceptual and an <u>affective</u> deficit. Behavioral anticipation requires the comparing in thought of various alternatives; it is the comparison between the affective responses they evoke which, Nauta suggested, keeps normal strategic functioning on line. An analogy may be made with sensory mechanisms, which are made ready for impending action by a process of corollary discharge from motor mechanisms. The frontal region may exercise a comparable function, presetting

the mechanisms that deal with interoceptive information. Such a presetting, in Nauta's words,

> could be thought to establish a temporal sequence of affective reference points serving as "navigational markers" and providing, by their sequential order, at once the general course and the temporal stability of complex goal-directed behavior. (p. 183)

Lacking the cortical connections to set up such affective markers, the frontally-lesioned patient suffers from an impairment in his strategic decision making, and "a tendency of projected or current action programs to "fade out" or become over-ridden by interfering influences . . ." (p. 184).

Such an affective registry does not in itself explain creative thought, but it suggests how the "coloration" of concepts in memory has not only a connective, but more significantly, an anticipatory role, given the appropriate conditions. In the studies on frontal patients the problems are set by the neurophysiologist. In creative thought, however, the problems are the outcome of anomalies in experience: they are set by the thought patterns of the creator himself, and his affects preset the directions in which a solution may be found. Since affects, according to Spiro et al., tend to link concepts that have been stored with the same experiential coloration, the concepts elicited by affect might come from domains far apart as well as from within the same domain, so that new combinations result.

During the preparation stage, therefore, under the influence of anomalies in experience, the new judgment forming under the impact of such anomalies--which comprises and reforms previous judgments--sets in motion affects connected with the anomalous experience; those affects effect a bridge between concepts normally not considered to be connected, and in so doing act as predictive markers offering directions in which to seek a solution to the anomalies. Creative thought might thus be conceived as being under the influence of a series of alternative possibilities for what the expected solution will be, kept on hand in a guiding set of affective reference points. The sense of the solution, it will be recalled, is typically given at the moment of illumination in affective form, suggesting that it is in its predictive power, its felt connections to a range of other concepts as yet beyond consciousness, that the productivity of affect lies. Poincaré, for one, it will be recalled, spoke of the anticipatory affective power of the moment of illumination and its sense of harmony. If affect is the agent for crossing conceptual domains and initiating transformations in thought at the preparation stage, then it is to be expected that the moment of illumination would be signalled in this way by a strong and predictive affective charge.

Indirect evidence for the anticipatory role of affect in thought is thus available from research on the brain. More direct evidence may eventually be obtained from studies of the response to metaphor. A first study by the author (Miall &

Vondruska, 1983a) has provided evidence implicating affect in the response to metaphor. In line with previous theoretical arguments (Miall, 1977, 1979), it was hypothesized that, compared with simile, metaphor involves a more radical transformation of its topic under the influence of the vehicle. Responses were obtained from children (3rd and 4th grades) and adults (college freshmen) to a set of stories about different characters, each containing either a metaphor or a simile. Evidence from the children involved in this study supported the hypothesis, since in the metaphor condition a higher proportion involved affective ideas connected with the character. In this way metaphor was seen as having a more powerful affective potential than simile, a potential which might have predictive properties under appropriate conditions. The results from the adults were more difficult to understand, since the opposite picture was obtained: more affective responses were made to the similes than to the metaphors. But one explanation for this, which helps relate the finding to the view of creative thought I have been presenting, is that through affect, metaphor in adults taps the judgmental level of response, and that this makes the ideas formed under the impact of the metaphor less easy to express. In line with this sugestion, it was also found that subjects in the metaphor condition were less fluent than those in the simile condition, generating fewer ideas in response to each story.

Affective conflict between vehicle and topic terms, in addition to the domain difference, signals an anomaly to the

receiver of a metaphor. If the metaphor is a sufficiently powerful or unusual one, it may also tap existing anomalies in the individual's structure of judgments and play a formative role in transforming some part of his thought world. It may be argued that this is the primary function of literary metaphor, since it can tap extensive regions of thought and draw them into new combinations (Miall, 1979).

Our study offers evidence that affect is a significant variable in response to metaphor. If this is correct, it may indicate that affect plays a constructive role in the comprehension process itself. In examining the response to metaphor it has not been easy to understand how vehicle and topic interact to transform the topic. Predominantly conceptual approaches involving similarity, or domain-mapping have not so far proved able to resolve all the problems associated with comprehending novel metaphors. One alternative which has yet to be considered is the affective cueing of salient concepts.

Affects of the same coloration may be attached to concepts in widely divergent domains. Affects induced by a given metaphor may therefore be the prime agents for linking the different domains of vehicle and topic. Under the impact of metaphoric dissonance, the inadequacy of concepts directly associated with the topic causes a search among more distant concepts that resonate with an affective coloration similar to the vehicle. Through the affect attaching to it, the vehicle of the metaphor initiates and guides this search, but does not determine its

results. Those concepts that are affectively similar to the vehicle are then applied to transforming the topic. As in the various mood-state studies, such as that of Spiro et al., the affect currently in consciousness provides the link to other concepts which are "primed" by it, or activated at a subthreshold level of excitement. In metaphor the vehicle is the affective prime, since this is the "out of place" concept: the vehicle draws attention to itself affectively.

If metaphor has this affective power, it may also "prime" concepts beyond those immediately relevant to its own interpretation. Thus, metaphor may make for greater textual cohesiveness--an idea that has long been accepted by literary theorists. Further experiments are now underway to test empirically the hypothesis that the affective power of metaphors has a predictive valence which would account for the developing sense of cohesiveness in texts where they occur.

The value of such research on metaphor in the context of the present discussion, lies in the fact that metaphor shows on a small scale all the principle features of the thought processes that are most significant in creative thought. If creative thought is analyzable as the presence of productive anomalies, the crossing of conceptual boundaries, the transformation of a subject within a given domain, and the intuition of a new order at the moment of illumination, as I have argued above, so is the response to metaphor. To understand the thought processes involved in interpreting metaphor--a goal which is still somewhat

remote--would be to travel a considerable distance towards an understanding of the mysteries of creativity itself. The key to both phenomena may be found in the predictive role of affects in thought--a topic which has so far received almost no experimental study.

The main lines of the present discussion have now been presented, but there remain several issues which should be briefly mentioned. The relation of affect to judgment forms one issue which has not yet been sufficiently clarified. While judgment, I have suggested, is at the basis of all thought, and is in a continual process of revision and renewal, this in itself contains only evolutionary, not transformational potential. It is affect that works to bring about transformations at the creative level, being more mobile than judgment and able to shift the meaning and connections of ideas more readily; but affect operates under the control of judgment in this respect. If this is the case, then it might be expected that it would be possible to discern the relation from the kind of introspective evidence with which this paper began.

An interesting, if obscure, distinction of this kind does appear to be made by several artists. Wordsworth (1965), for example, speaks of the poet as possessing

> an ability of conjuring up in himself passions, which are indeed far from being the same as those produced by real events, yet (especially in those parts of the general sympathy which are pleasing and delightful) do more nearly

> resemble the passions produced by real events, than anything which, from the moments of their own minds merely, other men are accustomed to feel in themselves . . . (p. 453)

This distinction between two sorts of "passions," one of which is a special resource of the poet, might suggest that Wordsworth is speaking of judgments and affects, respectively. The chief ability of the poet, therefore, lies in his ability to arouse a sense of judgment through his poetry. Another poet who mentions a type of feeling in poetry below ordinary feelings is Coleridge (1962). In a notebook entry (No. 2086) he remarks that:

> Poetry (is) a rationalized dream dealing . . . to manifold Forms our own Feelings, that never perhaps were attached by us consciously to our own personal Selves . . . O there are Truths below the Surface in the subject of Sympathy, & how we <u>become</u> that which we understandly behold & hear, having, how much God perhaps only knows, created part even of the Form.

A similar distinction can be found in T. S. Eliot's (1963, p. 10) cautious insistence that "The business of the poet is not to find new emotions, but to use the ordinary ones and, in working them up into poetry, to express feelings which are not in actual emotions at all."

The consideration of creative thought also carries implications for the nature of conceptual representation. Concepts cannot be bounded or unitary elements, since it is the open-ended, connotational connections of concepts at illumination

that link consciousness to the as yet unseen new whole in unconsciousness. Metaphor at its best, as I have argued elsewhere (Miall, 1979), also requires the support of such unconscious complexes of thought and judgment for its initial interpretation, and these are dependent on the transformation of the topic by the work of the vehicle in priming, or making salient, new concepts. It makes more sense to see such thought in terms of a "schema-of-the-moment" (Iran-Nejad & Ortony, 1982), drawing on the connotational resources of a variety of concepts, than as a series of activated links between concepts mapped in semantic space. This connotational connectedness of creative thought is well captured in a letter of the poet John Keats (1958), where he observes that

> every point of thought is the center of an intellectual world--the two uppermost thoughts in a Man's mind are the two poles of his World he revolves on them [sic] and everything is southward or northward to him through their means . . . (Vol. 1, p. 277)

"Everything" is no exaggeration here, if it is a transformation in the pattern of judgments involving the whole personality that is characteristic of creative thought.

This, finally, is the key implication of the view of creativity presented here. Creative thought is a continual process within the creative person, not confined to the periods during which actual creative work is taking place. It involves the creator in a continual effort to understand and, in a sense,

to make himself. Creative thought not only expresses the repertoire of judgments, it helps to clarify and redirect it; it reacts back on the creator in incalculable ways. As Jung (1966, p. 103) has said, "The work in process becomes the poet's fate and determines his psychic development. It is not Goethe who creates Faust, but Faust which creates Goethe."

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